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These are lecture notes for an undergraduate seminar covering Category Theory, taught by the author at Northwestern University. The book we roughly follow is "Category Theory in Context" by Emily Riehl. These notes outline the specific approach we're taking in terms the order in which

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lations in different areas of mathematics, which led them to develop category theory. Category theory is really about building bridges between different areas of mathematics. 1.1 Definitions and examples This is just about setting up the terminology. There will be no theorems in this chapter. Definition 1.1. A category C consists of

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School of Computer Science and Information Technology, University of Nottingham, 2001. M.Barr and C.Wells. Category Theory. Lecture Notes for ESSLLI, 1999. M.Fiore. Rough notes on presheaves. Notes for a postgraduate mini-course, PPS, Universite Paris Diderot - Paris 7, 2001. J.van Oosten. Basic Category Theory. Department of Mathematics ...

Category Theory for Computer Science
These notes were originally developed as lecture notes for a category theory course. They should be well-suited to anyone that wants to learn category theory from scratch and has a scientific mind. There is no need to know advanced mathematics, nor any of the disciplines where category theory is traditionally applied, such as algebraic geometry or theoretical computer science.

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Category Theory Lecture Notes University Of Edinburgh
Categories represent abstractions of other mathematical concepts. Many areas of mathematics can be formalised by category theory as categories. Hence category theory uses abstraction to make it possible to state and prove many intricate and subtle mathematical results in these fields in a much simpler way. A basic example of a category is the category of sets, where the objects are sets and the arrows are functions from one set to another.

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Introduction to concepts of category theory – categories, functors, natural transformations, the Yoneda lemma, limits and colimits, adjunctions, monads – revisits a broad range of mathematical examples from the categorical perspective. 2016 edition.

A short introduction ideal for students learning category theory for the first time.

An array of general ideas useful in a wide variety of fields. Starting from the foundations, this book illuminates the concepts of category, functor, natural transformation, and duality. It then turns to adjoint functors, which provide a description of universal constructions, an analysis of the representations of functors by sets of morphisms, and a means of manipulating direct and inverse limits. These categorical concepts are extensively illustrated in the remaining chapters, which include many applications of the basic existence theorem for adjoint functors. The categories of algebraic systems are constructed from certain adjoint-like data and characterised by Beck's theorem. After considering a variety of applications, the book continues with the construction and exploitation of Kan extensions. This second edition includes a number of revisions and additions, including new chapters on topics of active interest: symmetric monoidal categories and braided monoidal categories, and the coherence theorems for them, as well as 2-categories and the higher dimensional categories which have recently come into prominence.

Category theory reveals commonalities between structures of all sorts. This book shows its potential in science, engineering, and beyond.

Category Theory has developed rapidly. This book aims to present those ideas and methods which can now be effectively used by Mathe maticians working in a variety of other fields of Mathematical research. This occurs at several levels. On the first level, categories provide a convenient conceptual language, based on the notions of category, functor, natural transformation, contravariance, and functor category. These notions are presented, with appropriate examples, in Chapters I and II. Next comes the fundamental idea of an adjoint pair of functors. This appears in many substantially equivalent forms: That of universal construction, that of direct and inverse limit, and that of pairs offunctors with a natural isomorphism between corresponding sets of arrows. All these forms, with their interrelations, are examined in Chapters III to V. The slogan is "Adjoint functors arise everywhere". Alternatively, the fundamental notion of category theory is that of a monoid -a set with a binary operation of multiplication which is associative and which has a unit; a category itself can be regarded as a sort of general ized monoid. Chapters VI and VII explore this notion and its generaliza tions. Its close connection to pairs of adjoint functors illuminates the ideas of universal algebra and culminates in Beck's theorem characterizing categories of algebras; on the other hand, categories with a monoidal structure (given by a tensor product) lead inter alia to the study of more convenient categories of topological spaces.

The papers in this volume were presented at the fourth biennial Summer Conference on Category Theory and Computer Science, held in Paris, September3-6, 1991. Category theory continues to be an important tool in foundationalstudies in computer science. It has been widely applied by logicians to get concise interpretations of many logical concepts. Links between logic and computer science have been developed now for over twenty years, notably via the Curry-Howard isomorphism which identifies programs with proofs and types with propositions. The triangle category theory - logic - programming presents a rich world of interconnections. Topics covered in this volume include the following. Type theory: stratification of types and propositions can be discussed in a categorical setting. Domain theory: synthetic domain theory develops domain theory internally in the constructive universe of the effective topos. Linear logic: the reconstruction of logic based on propositions as resources leads to alternatives to traditional syntaxes. The proceedings of the previous three category theory conferences appear as Lecture Notes in Computer Science Volumes 240, 283 and 389.

A comprehensive reference to category theory for students and researchers in mathematics, computer science, logic, cognitive science, linguistics, and philosophy. Useful for self-study and as a course text, the book includes all basic definitions and theorems (with full proofs), as well as numerous examples and exercises.

An introduction to category theory as a rigorous, flexible, and coherent modeling language that can be used across the sciences. Category theory was invented in the 1940s to unify and synthesize different areas in mathematics, and it has proven remarkably successful in enabling powerful communication between disparate fields and subfields within mathematics. This book shows that category theory can be useful outside of mathematics as a rigorous, flexible, and coherent modeling language throughout the sciences. Information is inherently dynamic; the same ideas can be organized and reorganized in countless ways, and the ability to translate between such organizational structures is becoming increasingly important in the sciences. Category theory offers a unifying framework for information modeling that can facilitate the translation of knowledge between disciplines. Written in an engaging and straightforward style, and assuming little background in mathematics, the book is rigorous but accessible to non-mathematicians. Using databases as an entry to category theory, it begins with sets and functions, then introduces the reader to notions that are fundamental in mathematics: monoids, groups, orders, and graphs—categories in disguise. After explaining the "big three" concepts of category theory—categories, functors, and natural transformations—the book covers other topics, including limits, colimits, functor categories, sheaves, monads, and operads. The book explains category theory by examples and exercises rather than focusing on theorems and proofs. It includes more than 300 exercises, with solutions. Category Theory for the Sciences is intended to create a bridge between the vast array of mathematical concepts used by mathematicians and the models and frameworks of such scientific disciplines as computation, neuroscience, and physics.